Research article

Current Agricultural Status and Problems faced in Paghman District of Kabul Province, Afghanistan

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Abstract Afghanistan, an agricultural and land locked country, located in the heart of Asia. More than 75% of country's population is living in rural areas. Paghman District located in the Kabul Province of Afghanistan was selected for conducting this research. In Paghman District, there are some severe problems regarding agricultural land use, water resource conservation, and utilization. The objective of this study is to identify current agriculture status and problems faced in Paghman District for conserving water environment of the Qargha Reservoir qualitatively and quantitatively. To achieve the objectives, a questionnaire survey was conducted to find out the current agricultural status and problems faced in Paghman District. One or more local farmers (representatives) were selected from each of the 15 different villages in Qargha Reservoir watershed of Paghman District. The results indicated that water shortage, soil erosion, and low fertility were the major factors causing low agricultural productivity. Majority of the local farmers perceived water shortage magnitude as severe and very severe at 33%, respectively. Local farmers' awareness about soil erosion effects on their cultivated lands were minor. About 54% of the local farmers were not aware of the soil erosion effects on their lands. The correlation analysis showed that water shortage and soil erosion negatively affected the yields. The development of proper conservation strategies as well as farmers education on proper soil and water resource management is needed to achieve sustainable agriculture in Paghman District of Kabul Province, Afghanistan.

Keywords Paghman, Afghanistan, sustainable agriculture, low fertility, land use, water resource management

INTRODUCTION

Afghanistan is a country with majority of the population involved in agricultural activities and is located in the center of Asia. Afghanistan is bordered by Pakistan in the south and the east, Iran in the west, Turkmenistan, Uzbekistan and Tajikistan in the north, and China in the far northeast. More than 75% of country's population is living in rural areas, and 50% or more of the GDP is generated by agriculture and related sectors in rural areas. By far, the greatest part of the land surface of Afghanistan is extensive grazing land, desert, and semi-desert or high or Steep Mountain, only about 40% is said to be suitable for winter grazing (Thieme, 2006).

Afghanistan faces problems of effective use of water resource, an increase of irrigation area, and improvement of irrigation method (Kawasaki et al., 2012). Rainfall varies from a low 75 mm in Farah Province to 1,170 mm in south Salang, occurs mostly in the winter months and particularly in the February/April period. The wet season is concentrated in winter and spring when the vegetative cover is low. In higher elevation, precipitation falls in the form of snow that is highly critical for river flow

and irrigation in summer. From June to October, Afghanistan receives hardly any precipitation. The Afghan climate is continental with temperatures ranging from above 30° C in summer to below -20° C in winter. In spring, late frost can affect fruit production (Favre and Kamal, 2004)**.** According to Saba et al., (2001), only 6% of the 15% of land in Afghanistan is usable. Due to the nature of the topography and the arid climate, vast areas are subject to soil erosion. The annual average soil loss rate of Kabul River Basin was estimated to be 19 tons/acre/year (4748 tons/km^2/year) (Sahaar, 2013). Agriculture production has been considered as a key sector for the revival of the economy and well-being of the people in the country, but it is not enough level to achieve the food self-sufficiency and to export of agricultural products (Kawasaki et al., 2012). The objective of this study is to identify current agricultural status and problems faced in Paghman District of Kabul Province, Afghanistan for conserving Qargha Reservoir water environment qualitatively and quantitatively by reducing sediment yield, nutrient loss, and irrigation water shortage.

METHODOLOGY

Paghman District is located in west part of Kabul Province of Afghanistan, total of the area is 361 km^2, and average annual rainfall is 473 mm. Qargha Reservoir is located in Paghman District. Qargha Reservoir is used for irrigation and recreational purposes. Furthermore, Qargha Reservoir provides irrigation water for more than 2,000 hectares of farmland. Only seven extension workers are responsible for managing agriculture in the whole study area with more than 150,000 population.

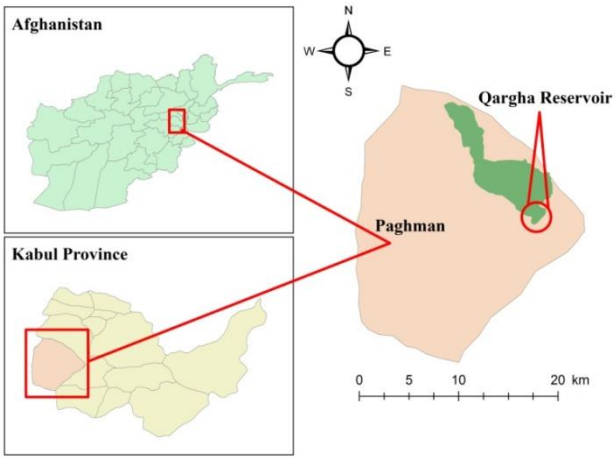

Fig. 1 Location of Qargha Reservoir Paghman District, Kabul, Afghanistan

Table 1 Land cover and land use classification in Paghman District (FAO, 2016)

Irrigated land (ha)	Fruit trees (ha)	Vineland (ha)	Barren land (ha)	Forest shrub (ha)	Rangeland (ha)	Build up (ha)	Water body (ha)	Total (ha)
8,080. 63	1,419.50	31.5	456,59	99.93	24,587.40	907.9	537.4	36,120
22.37%	3.93%	0.09%	1.26%	0.28%	68.07%	2.76%	1.49%	100%

In order to identify the current agricultural status and problems faced in Paghman District of Kabul Province, Afghanistan, a questionnaire survey was conducted in Paghman District of Kabul Province, Afghanistan. Paghman District is located in the west of Kabul Province with 361 km^2 area. Qargha Reservoir is located in the Paghman District and used for irrigation and recreational purposes.

In total, 24 local farmers were interviewed. One or more local farmers (representatives) were selected from each of the 15 different villages in Qargha Reservoir watershed of Paghman District, Kabul Province, Afghanistan. The questionnaire sheets contain different type of questions; the questions were on basic information of the local farmers, cultivated crop and yield, soil erosion effects, irrigation water shortage and irrigation water sources, future farming plan, fertilizer application, agricultural extension services, assistance and technical training as shown in Table 2.

Table 2 Type of questions in the questionnaire sheet

Category	Related question	Details
Basic information	Farmer's information	Name, gender, household, address, education, age and cooperative
Future farming	Continue farming	Yes, no and not decided
Fertilizer application	Type of fertilizer	MAP/DAP, Urea, farmyard manure, green manure, compost
Soil erosion effects	Soil erosion effect on fertility and crop field	Destroy crop, decrease productivity and not aware
Agriculture Extension service	Extension service provision	Extension worker visit to the field
Assistance and technical training	Any kind of agricultural aid to the farmers by Govt./NGO	Improved seed and nursery stock, machinery, fertilizer and medicine
Irrigation water shortage and irrigation water source	Water shortage severity and source of irrigation	Water source and water shortage severity

RESULTS AND DISCUSSION

Pre-harvest Agricultural Problems

Afghanistan is a country in which local farmers face a number of pre-harvest problems, which causes their farmlands to yield low and direct them to agricultural insufficiency. The common problems local farmers face are diseases and pests, low fertility, water shortage, and unwanted weed. In Afghanistan, local farmers face agricultural problems during a complete growing session starting from land preparation and sowing until harvesting. According to the results diseases/pests, irrigation water shortage, soil erosion, and low fertility were the major problems in the study area with 63%, 83%, 50%, and 29%, respectively as shown in Fig. 3. Former studies have indicated that water shortage, nutrient loss, and soil erosion are the dominant problem in Afghanistan (Kawasaki et al., 2012; Sahaar, 2013; Safi et al., 2016). Besides other factors, lack of agricultural technical knowledge is the source of low productivity.

Extension workers as shown in Fig. 2 did not visit the majority (88%) of the farmers. Thus, Agriculture in many parts of the country remains starkly underdeveloped. Hence, to solve these problems faced in the study area, proper conservation strategies as well as farmers' education on proper soil and water resource management.

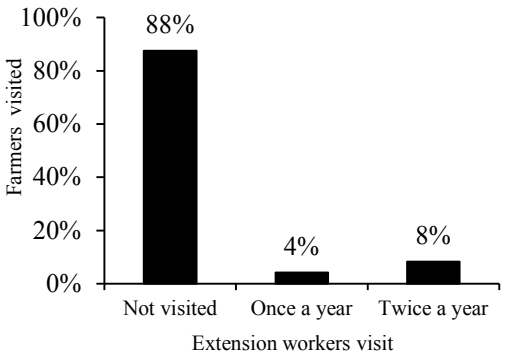

Fig. 2 Extension workers visit

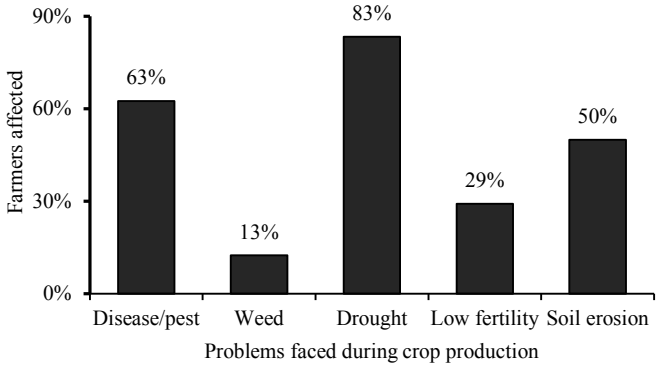

Fig. 3 Problems faced during crop production

Water Shortage

The availability of water resources is vital to the social and economic well-being and rebuilding of Afghanistan. In the Kabul Basin, 10% reduction in recharge was simulated to assess the hydrologic effect of potential climate change on groundwater resources (USAID, 2010). Size of cultivated land in Afghanistan is 3.9 million ha of which 1.3 ha is rain-fed and 2.6 million ha is irrigated land. Almost 85% of all agricultural production is produced in irrigated areas. The rainfall begins in October, reaches its peak in March and ends in May. It hardly rains during the periods from June to October, especially in summer when the temperature is high.

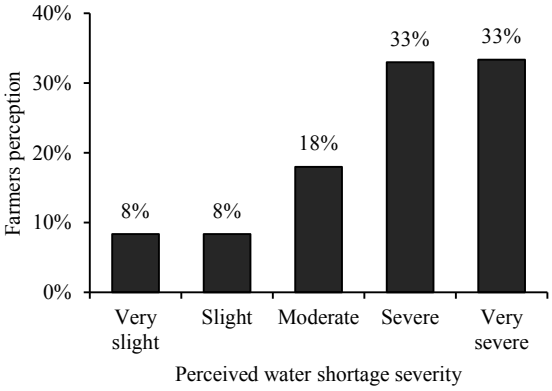

Fig. 4 Farmers perception on water shortage

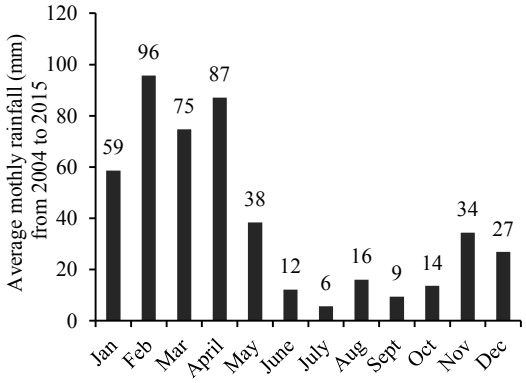

Fig. 5 Average monthly rainfall (MAIL, 2016)

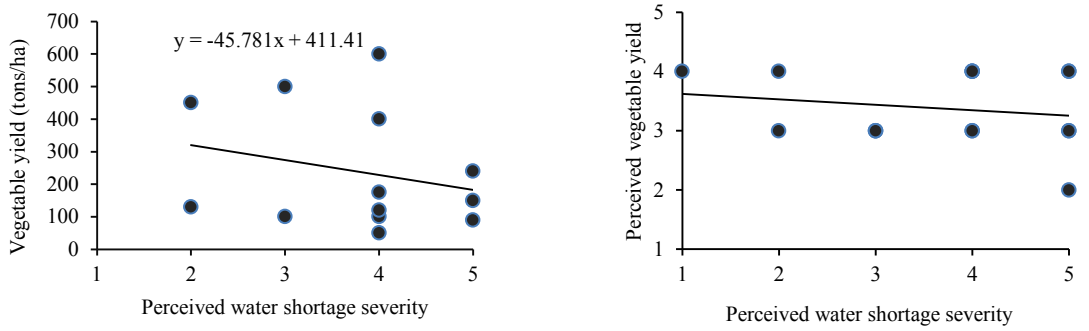

Fig. 6 Trends between vegetable yield and perceived water shortage

Majority of the farmers perceived water shortage as severe and very severe at 33% and 33%, respectively. As a result, the problem of water shortages frequently occurs in the latter part of the growing season between April and October, causing a major deficit in crop yield. Agriculture in Afghanistan faces a problem of water shortages during the latter half (summer) of planting period. The issue is the wastage of water due to the aging of irrigation facilities and unorganized irrigation practices. Therefore, the efficient use of limited water resources is an issue of paramount importance (Kawasaki et al., 2012). Correlation analysis indicated crop yield was affected by water shortage in the study area. Hence, water shortage would cause low water inflow into Qargha reservoir. Therefore, irrigation potential of Qargha reservoir is negatively affected. Karezes (Karez is a tunnel system used to extract shallow groundwater) and tube wells were the major irrigation water sources in Paghman District.

Soil Fertility Management

Afghanistan's soils are mainly alkaline, soil pH ranges from 7 to 8.5, rich in calcium and potassium minerals. Soil organic matter content ranges from 0.2 to 2.5% (Alemi, 2010). According to the results farmyard manure, chemical fertilizers and crop rotation were the common soil fertility management practices in the study area, with 100%, 96%, and 71%, respectively. Local farmers usually used farmyard manure for soil fertility management, mainly made of cow, goat and sheep dung alongside human excreta. Chemical fertilizers were usually applied to the field by broadcasting on the soil and banding around plant roots. The liquid form of fertilizer application is not common practice in Afghanistan, only used in governmental and non-governmental owned farms. Hence, local farmers use intercropping and crop rotation in the agricultural field by growing alfalfa and clover to manage soil fertility. Urea (96%) and DAP (92%) were the major chemical fertilizers used for soil fertility enhancement in the study area as shown in Fig. 7. Potassium fertilizers are rarely used in Afghanistan. Nitrogen, phosphorous, zinc and iron, are the major elements deficient in Afghanistan soils. Organic fertilizers or Chelates (combination of an organic compound with a metallic ion) are rarely used by farmers.

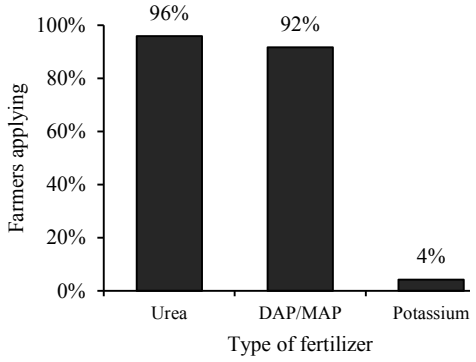

Fig. 7 Extension workers field visit

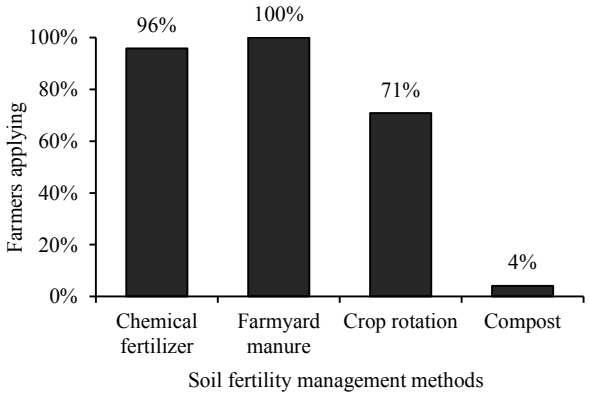

Fig. 8 Soil fertility management practice

Soil Erosion

Soil erosion is one of the issues influencing soil fertility all over the country. Due to irregular topography and low land cover, Afghanistan soils are subjected to soil erosion risk. The annual average soil loss rate of the Kabul River Basin was estimated to be 47.4 tons/ha/year and the gross mean annual soil loss rate was approximately 47.4 million tons/year. By producing 57% of the total annual average soil loss, rangelands were the primary contributor to the basin. Barren lands by producing about 38%

were the second largest contributor to the overall soil loss rate in the basin (Sahaar, 2013). Paghman District land use map shows that rangeland made 68.07% of the total land with low land cover and steep slopes, which increases the risk of soil erosion. Half of the total local farmers responded that they faced soil erosion during crop production. Thus, the majority (54%) of the responded local farmers were not aware of soil erosion effects on their cultivated lands. In case, if soil erosion occurs in the study area, Qargha reservoir would be at the receiving end by receiving a high amount of sediment yield, which could decrease water storage capacity. Safi et al., (2016) reported that surface runoff causes a significant amount of nitrogen, phosphorous, potassium and carbon losses from agricultural fields. In case, in the study area, local farmers did not realize the significance of soil erosion. It is the responsibility of governmental and non-governmental organizations to increase local farmer's awareness about soil erosion effects by offering them technical training courses and workshops in the study area.

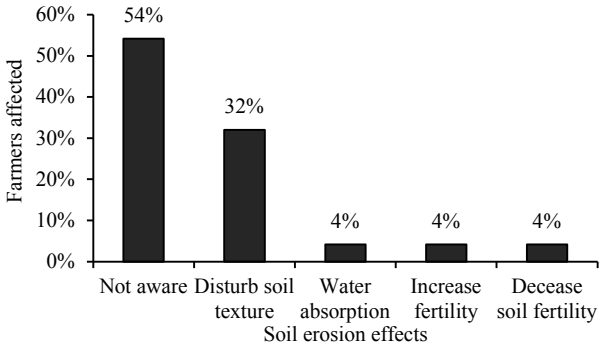

Fig. 9 Soil erosion effects

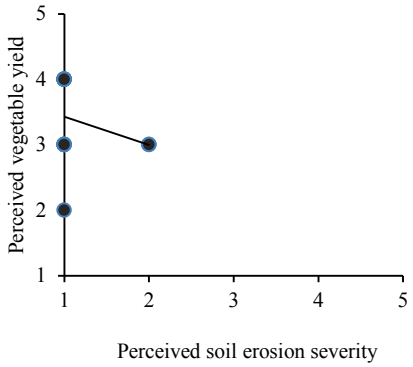

Fig. 10 Trends between perceived vegetable yield and soil erosion

CONCLUSION

This study was to identify current agricultural status and problems faced in Paghman District of Kabul Province, Afghanistan for conserving water environment of Qargha Reservoir qualitatively and quantitatively. Water shortage was one of the issues local farmers seriously faced during cropping season in the study area. About 83% of the farmers responded that they faced water shortage during crop production. Wells and karezes were the major water sources used for irrigation. Half of the local farmers faced soil erosion during crop production. However, local farmers' awareness about soil erosion effects was at very low level. The majority (54%) of the local farmers were not aware of soil erosion effects on their cultivated lands. Farmyard manure, chemical fertilizers, and crop rotation were the common soil fertility management practices in the study area with 100%, 96%, and 71%, respectively. Correlation analysis showed that soil erosion and irrigation water shortage negatively affected productivity. Soil erosion, low fertility, and irrigation water shortage were identified as major factors causing low agricultural productivity. Therefore, proper conservation strategies, as well as farmers education on proper soil and water resource management is needed to achieve sustainable agriculture in Paghman District of Kabul Province, Afghanistan.

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